

R E M A R K S

Notice of References Cited (Form PTO-892)

The Notice of References Cited that was attached to the Office Action contains the following errors:

USP 3,313,602 to "Flack" should be to "Smith"; and

USP 3,340,567 to "Fitch" should be to "Flack."

In view of the above, the Examiner is respectfully requested to provide a corrected Form PTO-892.

Amendments to the Specification

Minor clerical errors were corrected on pages 28 and 35 of the specification.

Claim Amendments and New Claims

The first underlined amendment to claim 8 ("the dripping nozzle or dripping nozzles being placed above an aqueous ammonia solution reservoir so that an opening or openings of the dripping nozzle or dripping nozzles are directed downward and face the

aqueous ammonia solution") is supported by Figs. 1, 3, 5, 8, 10, 12, 14, 17 and 21. In Fig. 1, the dripping nozzle device 2 is shown having four nozzles 4, which are disposed over the aqueous ammonia solution reservoir 3, so that the opening(s) of the nozzles are directed downward and face the aqueous ammonia solution. This is also shown in Figs. 5, 8, 17 and 21.

Support for this amendment is also found in the following excerpts of the specification:

Page 50, lines 5 to 8:

"Also, for the dripping nozzle device can be used the examples of the dripping nozzle device that were explained in relation to the first to three embodiments."

Page 59, lines 16 to 19:

"The dripping nozzle device 2 has nozzles 4 that are aligned with one end of each nozzle 4 facing down and the longitudinal axes of the nozzles being parallel with each other."

Page 60, lines 7 to 9:

"The dripping nozzle device 2 is placed above the aqueous ammonia solution reservoir 3 so that the drops fall in the central part of the horizontal section of the reservoir 3."

Page 60, lines 14 to 16:

"For the dripping nozzle device 2 may also be employed the suitable dripping nozzle devices explained in the other embodiments."

The other amendment to claim 8 ("having a temperature-controlling function") is supported on page 51, line 17 of the specification as follows:

"The feedstock liquid reservoir 25 has a temperature-controlling function, the mechanism for which is not shown in the figures."

Claims 12 and 13 were amended into independent form by inclusion of the features of claim 10.

Claim 13 was also amended to recite "continuum irradiator," which is supported in the specification on page 63, lines 27 and 29 and page 64, line 17.

The amendments to claim 14 include features from original claim 18 and features supported in the specification on page 68, line 2 to page 69, line 13; and page 74, third paragraph to page 75, last line.

The amendments to claim 18 include features from original claim 14.

Minor editorial revisions were made to claims 26, 28 and 32.

In claim 31, the terminology "...the flow regulator having a flow regulator valve and a flowmeter" is supported in the specification as follows:

Page 34, lines 12 to 14:

"Each flow regulator 11 comprises a flow regulating valve, which is not shown in the figure, and a flowmeter, which is not shown in the figure, either."

Page 34, line 28 to page 35, line 12:

"For the flow regulating valve may be used a known flow regulating valve, such as a globe valve, a butterfly valve, or a diaphragm pump.

A globe valve is shown in Figure 4 as an example of the flow regulating valve.

The flow-regulating valve 14 shown in Figure 4 has a handwheel 15, a valve rod 16, a cap 17, a valve guard 18, a valve 19, and a valve box 20.

The flow-regulating valve 14 is capable of controlling the flow rate so that the volumes of the feedstock liquid being sent to the respective nozzles are the same, and therefore the employment of this valve is preferable.

For the flowmeter may be used a known flowmeter, such as an area flowmeter, a positive displacement flowmeter, a turbine flowmeter, or a vortex shedding flowmeter."

Claim 36 was amended to include the features added to claim 18.

New claim 40 includes the feature of claim 28.

New claim 41 includes the features of claim 29.

New claim 42 is supported in the specification on page 62, fourth paragraph to page 63, fourth paragraph.

New claim 43 is supported in the specification on page 65, second paragraph to page 67, second paragraph.

New claim 44 is supported in the specification on page 69, last paragraph to page 70, second paragraph and page 73, last paragraph to the third paragraph on page 75.

New claim 45 is supported in the specification on page 71, last paragraph to page 73, second paragraph and page 74, first paragraph to page 75, third paragraph.

New claim 46 is supported in the specification on page 69, first and second paragraphs, and the second paragraph on page 74.

Obviousness Rejections Under 35 USC 103

claims 8 and 26 to 27 were rejected under 35 USC 103 as being unpatentable over Hideji Yoshimuta (JP 5-279043) in view of

Langen et al. (USP 4,224,258) for the reasons set forth on pages 3 to 5 of the Office Action.

Regarding applicants' claim 8, it was admitted in the Office Action that Yoshimuta does not specify a feedstock liquid reservoir and a feedstock liquid transferring passage.

Regarding applicants' claim 8, it was also admitted in the Office Action that Yoshimuta does not disclose a remaining feedstock liquid collector placed between a dripping nozzle or dripping nozzles of a dripping nozzle device and the aqueous ammonia solution for receiving a remainder of the feedstock liquid remaining in the feedstock liquid transferring passage when the dripping of the feedstock liquid from the dripping nozzle or nozzles to the aqueous ammonia solution is stopped; and a feedstock liquid remainder transferring passage for transferring the remainder to the feedstock liquid reservoir.

The apparatus illustrated in Fig. 1 of Langen et al. provides a horizontally directed nozzle 2 for projecting a stream of liquid. There are formed particles that are not sufficiently uniform, either because this stream has not yet been established or because this stream is in a state of collapse. The

occurrence of unequally sized particles at the approach or withdrawal is caused by the direction of the nozzle 2 disposed horizontally.

On the other hand, the apparatus illustrated in Fig. 2 of Langen et al. comprises a nozzle 2' disposed above the container 12 so that the opening of which is directed downward and faces the aqueous ammonia solution, as is the case in Yoshimuta. So, each of the apparatus illustrated in Fig. 2 of Langen et al. and the device of Yoshimuta does not have the same problem as the apparatus in Fig. 1 of Langen et al. The reason that the apparatus illustrated in Fig. 2 of Langen et al. does not have a funnel and a diaphragm is because it does not have the same problem as the apparatus illustrated in Fig. 1.

Therefore, it is respectfully submitted that there is no reason or motivation for combining Yoshimuta and Langen et al.

Additionally, Yoshimuta and Langen et al. are silent regarding a feedstock liquid reservoir having a temperature-controlling function (see page 51, line 17 of applicants' specification).

In contrast to the references, in the presently claimed invention, a device is provided wherein a feedstock liquid (including uranyl nitrate) remaining in the feedstock liquid transferring passage from the previous batch operation (the temperature of which feedstock liquid is not adjusted) is mixed with the feedstock liquid for a new batch operation, the temperature of the mixture is adjusted, and then the mixture is dripped into an aqueous ammonia solution to produce ammonium diuranate ("ADU") particles. Therefore, the uranium dioxide particles do not have any problems; they are particles with good sphericity, have a substantially uniform particle size and a flawless inside structure. In the apparatus according to the presently claimed invention, ammonium diuranate ("ADU") particles of uniform quality, which lead to such excellent uranium dioxide particles, can be produced at a high yield. The apparatus is very useful for the production of fuels for high-temperature gas reactors (see the paragraph bridging pages 53 to 54 of applicants' specification).

It is therefore respectfully submitted that applicants' claim 8 patentably distinguishes over the references.

Regarding applicants' claim 26, since claim 8 is submitted to be patentable, claim 26 (which depends on claim 8) should also be patentable. Furthermore, Yoshimuta is silent concerning a vibrator for vibrating the nozzles simultaneously. Yoshimuta discloses merely that the dripping nozzle may vibrate (see paragraphs [0014] and [0025] of Yoshimuta) and that the apparatus may have several dripping nozzles.

Regarding applicants' claim 27, since claim 8 is submitted to be patentable, claim 27 (which depends on claim 8) should also be patentable. Moreover, Yoshimuta is completely silent with respect to a feedstock liquid supplier for supplying the feedstock liquid to nozzles substantially at a constant flow rate and without pulsation. The following is a English-language translation of paragraph [0035] of Yoshimuta, which was referred to in the Office Action:

"[0035]
[Working Example 1]

A uranyl nitrate solution with the uranium content of 250 g/liter, the concentration of polyvinyl alcohol resin as a high polymer of 30 g/liter, and a viscosity of 92 cp (at 30°C) was prepared. Drops of the uranyl nitrate solution with a diameter of 2.1 mm were formed

under the conditions where the vibration frequency of the dripping nozzle was 100 Hz and the amplitude was 0.36 mm."

Furthermore, a feedstock liquid supplier, such as a plunger-type metering pump, is not taught or suggested by Yoshimuta.

Claims 10, 12 to 13 and 28 to 39 were rejected under 35 USC 103 as being unpatentable over Hideji Yoshimuta (JP 5-297043) in view of Kato Ryota (JP 2000-146993) for the reasons set forth on pages 5 to 7 of the Office Action.

It was admitted in the Office Action that Yoshimuta does not specify a feedstock liquid reservoir.

Claim 10 was canceled hereinabove. As discussed above, claim 12 was amended into independent format to include features of claim 10.

Yoshimuta was discussed hereinabove.

With regard to applicants' claim 12, Ryota is completely silent with respect to a strobe light irradiator for emitting a light that flashes on and off periodically.

Ryota is directed to a detecting method for detecting a transfer rate and volume of a moving object comprising: irradiating with light to an acceptance surface from a light

source, wherein the acceptance surface faces the light source with the path of the moving object in between; and calculating the transfer rate and volume of the moving object based on change of a project area of the moving object in the acceptance surface (see clam 1 of Ryota). The change of a project area of the moving object is detected by the output voltage of the acceptance surface. The output voltage in the state which the acceptance surface is covered with the moving object corresponds to the output voltage of the state which the light source turns-off (see paragraphs [0012] and [0013] of Ryota). The amount of incident light to the acceptance surface is directly proportional to the output voltage (see paragraph [0020] of Ryota). In the detecting method of Ryota, a continuum light source must be use. Therefore, Ryota does not disclose or suggest the strobe light irradiator recited in applicants' claim 12.

As discussed hereinabove, applicants' claim 13 was amended into independent format. Whereas applicants' claim 12 recites a strobe light irradiator, applicants' claim 13 recites a continuum light irradiator.

With respect to applicants' claim 13, Ryota is silent concerning a controller for controlling flow regulators upon an input of a sensing signal outputted by photosensors so that nozzles drip at the same dripping rate, the drops dripped from each nozzle have the same volume, and a drop dripped from one of the nozzles has the same volume as a drop dropped from any other one of the nozzles.

The following is an English-language translation of the paragraph [0013] of Ryota, which is referred to in the Office Action. The controller discussed above is not taught or suggested by Ryota:

"[0013]
According to the invention of claim 2, the acceptance surface is composed of a light receiving element, and variation with time of a project area of the moving object is calculated by regarding the output voltage of the light receiving element in the state which the light source turns off as the output voltage in the state which the acceptance surface (the light receiving element) is covered with the shadow of the moving object."

Regarding applicants' claim 28 (which depends on claim 12), since claims 12 and 13 are submitted to be patentable, claim 28

should be patentable. Furthermore, Yoshimuta is silent concerning a vibrator for vibrating the nozzles simultaneously. Yoshimuta discloses merely that a dripping nozzle may vibrate (see paragraphs [0014] and [0025] of Yoshimuta) and that the apparatus may have several dripping nozzles.

Regarding applicants' claim 29 (which depends on claim 12), since claims 12 and 13 are submitted to be patentable, claim 29 should be patentable. Moreover, Yoshimuta is completely silent concerning a feedstock liquid supplier for supplying a feedstock liquid to nozzles substantially at a constant flow rate and without pulsation. An English-language translation of the paragraph [0035] of Yoshimuta, which is referred to in the Office Action, is set forth hereinabove. A feedstock liquid supplier, such as a plunger-type metering pump, is not taught or suggested by Yoshimuta.

Regarding applicants' new claim 42, since claim 12 is submitted to be patentable, claim 42 (which depends on claim 12) should also be patentable. Furthermore, Yoshimuta and Ryota are silent regarding the nozzles and flow regulators in applicants' claim 42.

Regarding applicants' new claim 43, since claim 13 is submitted to be patentable, claim 43 (which depends on claim 13) should also be patentable. Furthermore, Yoshimuta and Ryota are silent concerning the controller recited in applicants' claim 43.

Claims 14, 17, 18 and 30 to 35 were rejected under 35 USC 103 as being unpatentable over Langen et al. (USP 4,224,258) for the reasons set forth on pages 7 to 9 of the Office Action.

It was admitted in the Office Action that Langen et al. do not disclose the distance between the ends of the dripping nozzles and the ends of the ammonia gas spraying nozzles is from 10 mm to 40 mm, the shortest distance between the paths along which the drops dripped from the ends of the dripping nozzles fall and the ends of the ammonia gas spraying nozzles is from 3 mm to 15 mm, and the flow rate of the ammonia gas sprayed from the ammonia gas spraying nozzles is from 3 L/min to 25 L/min.

Langen et al. are silent concerning the aqueous solution discharger having an overflow discharging hole in the circumferential sidewall, which is recited in applicants' claim 14. Outlet 9 illustrated in Fig. 2 of Langen et al. is used for drawing-off the particles of nuclear fuel or breeder material

formed by hardening in the container 1 at the bottom. On the other hand, since the aqueous ammonia solution discharger has an overflow discharging hole in the circumferential sidewall in applicants' claim 14, the ammonia solution stored in an aqueous solution reservoir, except ammonia diuranate particles, overflow through the overflow discharging hole.

It is therefore respectfully submitted that applicants' claim 14 is patentable over Langen et al.

Regarding applicants' claims 17, 18, 30 to 35 and new claims 42 and 43, since claim 14 is submitted to be patentable, claims 17, 18, 30 to 35 and new claims 44 and 45 should be patentable, since all of these claims depend directly or indirectly on applicants' claim 14.

Regarding applicants' claim 17, Langen et al. do not teach or suggest the flow rates of the ammonia gas sprayed from the respective ammonia gas-spraying nozzles are adjustable. The advantages of such feature is described in the last paragraph on page 75 of applicants' specification.

Regarding applicants' claim 18, Langen et al. do not teach or suggest the distance between the ends of the dripping nozzles

and the ends of the ammonia gas spraying nozzles, the shortest distance between the paths along which the drops dripped from the ends of the dripping nozzles fall and the ends of the ammonia gas spraying nozzles, and the flow rate of the ammonia gas sprayed from the ammonia gas spraying nozzles.

Regarding applicants' claim 30, Langen et al. are silent concerning the dripping nozzle device comprising a single vibrator for vibrating the nozzles simultaneously.

Regarding applicants' claim 31, Langen et al. are silent with respect to a dripping nozzle device comprising a flow regulator capable of controlling a dripping rate of the feedstock liquid and a volume of each of the drops for each nozzle, wherein the flow regulator having a flow regulating valve and a flowmeter. The flow regulator is described in the first embodiment of applicants' specification.

Regarding applicants' claim 32, Langen et al. are silent concerning a dripping nozzle device comprising a feedstock liquid container capable of containing a predetermined volume of the feedstock liquid supplied from a feedstock liquid reservoir in which the feedstock liquid is stored, the container having an

inner volume larger than the inner volume of each of the dripping nozzles, wherein the container supplies the contained feedstock liquid to all the dripping nozzles by the force of gravity. The feedstock liquid container is described in the second embodiment of applicants' specification.

As for the method of controlling a dripping rate of the feedstock liquid, the first embodiment corresponding to applicants' claim 31 is different from the second embodiment corresponding to applicants' claim 32. Langen et al. does not disclose both the flow regulator of applicants' claim 31 and the feedstock liquid container.

Regarding applicants' claim 34, Langen et al. are silent with respect to a feedstock liquid container being directly connected to all the dripping nozzles.

Regarding applicants' new claim 44, Langen et al. are silent concerning the ammonia gas sprayer being placed above the opening end of the aqueous ammonia solution reservoir at a location where the sprayers do not block-up the opening so that the path of the ammonia gas sprayed from each ammonia gas-spraying nozzle is perpendicular to the corresponding falling path of drops of the

feedstock liquid dripped from the nozzles.

Regarding applicants' new claim 45, Langen et al. are silent with respect to an ammonia gas discharger being placed opposite the ammonia gas sprayer with the falling path in between, wherein the discharger discharges the sprayed ammonia gas.

Regarding applicants' new claim 46, Langen et al. are silent concerning a device for solidifying the surfaces of drops comprising both an ammonia gas sprayer and an ammonia gas-supplying outlet.

Claims 36 to 38 were rejected under 35 UC 103 as being unpatentable over Langen et al. (USP 4,224,258) in view of Kato Ryota (JP 2000-146993) and further in view of Hideji Yoshimuta (JP 5-279043) for the reasons set forth on pages 10 to 13 of the Office Action.

It was admitted in the Office Action that Langen et al. do not disclose that the feedstock liquid remainder transferring passage for transferring the remainder to the feedstock liquid reservoir.

It was further admitted in the Office Action that Langen et al. do not disclose a device for supplying the feedstock liquid

comprising a light irradiator for irradiating the drops with light, and flow regulators, each of which controls an amount of the feedstock liquid to be supplied to each dripping nozzle from the feedstock liquid reservoir, depending on conditions of the falling of the drops irradiated with the light.

It was also admitted in the Office Action that Langen et al. do not disclose the distance between the ends of the dripping nozzles and the ends of the ammonia gas spraying nozzles is 10 mm to 40 mm, the shortest distance between the paths along which the drops dripped from the ends of the dripping nozzles fall and the ends of the ammonia gas spraying nozzles is from 3 mm to 15 mm, and the flow rate of the ammonia gas sprayed from the ammonia gas spraying nozzles is from 3 L/min to 25 L/min.

Moreover, it was admitted in the Office Action that Langen et al. do not disclose a device for circulating the aqueous ammonia solution comprising an aqueous ammonia solution circulating path through which the aqueous ammonia solution is circulated and returned to the aqueous ammonia solution reservoir, from a lower part of the reservoir, whereby ammonium diuranate particles produced by a reaction between uranyl nitrate

and ammonia flow upward in the aqueous ammonia solution.

Regarding applicants' claim 36, please see the above argument with respect to applicants' claim 8. It is respectfully submitted that there is no reason or motivation for combining Langen et al. and Yoshimuta. Furthermore, these references do not teach or suggest a feedstock liquid reservoir having a temperature-controlling function.

Regarding applicants' claims 37 and 39, since claim 36 is submitted to be patentable and claims 37, 38 and 39 depend directly or indirectly on claim 36, claims 37, 38 and 39 should also be patentable.

It is therefore respectfully requested that each of the 35 USC 103 rejections be withdrawn.

Reconsideration is requested. Allowance is solicited.

A Form PTO-2038 in the amount of \$532 is enclosed herewith in payment of six additional total claims and one additional independent claim. Any additional fees or overpayments are hereby authorized to be charged to Deposit Account No. 06-1378.

An INFORMATION DISCLOSURE STATEMENT is being filed concomitantly herewith.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,



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(2) INFORMATION DISCLOSURE STATEMENT